CLAIMS

What is claimed as new and desired to be protected by Letters Patent of the United States is:

1. An image processing apparatus comprising:

a storage system for storing first data corresponding to at least one actual image and second data corresponding to at least one of at least one dark current reference image and at least one white reference image captured by a pixel array; and

a processor coupled to said storage system for compensating said first data using said second data.

2. The image processing apparatus according to claim 1, wherein said storage system stores gain conditions and exposure times associated with said first data and gain conditions and exposure times for said second data, said processor performs said compensation using said second data, having an associated gain and exposure time that most closely matches the gain and exposure time associated with said first data.

3. The image processing apparatus according to claim 2, wherein said processor performs dark current and defective pixel compensation on said first data.

4. The image processing apparatus according to claim 2, wherein said pixel array captures a plurality of dark current reference images under a plurality of gain and exposure conditions, and said respective second data corresponding to said plurality of captured dark current reference images is stored along with associated gain and exposure condition information for each dark current reference image in said storage system.

5. The image processing apparatus according to claim 2, wherein said pixel array captures a plurality of white reference images under a plurality of gain and exposure conditions, and said respective second data corresponding to said plurality of white

reference images is stored in said storage system together with associated gain and exposure information.

6. The image processor apparatus according to claim 5, wherein said pixel array further captures said plurality of white reference images under a plurality of light conditions and said respective second data corresponding to said plurality of white reference images is also stored together with an associated light condition.

7. The image processing apparatus according to claim 6, wherein said plurality of light conditions comprise a no light condition, a first light condition and a second light condition having a higher Lux value than said first light condition.

8. A method for pixel compensation, the method comprising:

capturing, using a pixel array, first data corresponding to one of at least one dark current reference image and at least one white reference image;

storing reference data corresponding to said one of said at least one dark current reference image and said at least one white reference image in a storage system;

capturing, using a pixel array, at least one actual image;

storing second data corresponding to said at least one actual image in said storage system; and

compensating said second data using said reference data.

9. The method according to claim 8, wherein said act of compensating is performed while a digital camera is in an idle state.

10. The method according to claim 8, wherein said act of compensating further comprises:

identifying pixels affected by dark current using said at least one dark current reference data;

compensating said second data at pixel locations using said reference data; and

storing said compensated second data in said storage system.

11. The method according to claim 8, further comprising:

identifying pixels as defective pixels using said reference data;

compensating said second data at pixel locations using said reference data; and

storing said compensated second data in said storage system.

12. The method according to claim 8, further comprising:

capturing a plurality of dark current reference images under a plurality of gain conditions and exposure times for creating a respective dark current reference data and for each combination of said plurality of gain and exposure conditions, identifying locations of dark current pixels which require compensation; and

creating from said captured plurality of dark current reference images said respective dark current reference data and for each gain combination of gain conditions and exposure times, identifying locations of hot pixels which require compensation.

13. The method according to claim 8, further comprising capturing a plurality of white reference images under a plurality of gain conditions and exposure times for creating a respective defective pixel reference data, and for each combination of gain conditions and exposure times, identifying locations of defective pixels which need compensation.

14. The method according to claim 8, further comprising capturing said plurality of white reference images under a plurality of light conditions for creating a respective defective pixel reference data, and for each of said plurality of light conditions, identifying locations of defective pixels which require compensation.

15. The method according to claim 14, wherein said plurality of light conditions comprise a no light condition, a first light condition and a second light condition having a higher Lux value than said first light condition.

16. The method according to claim 15, further comprising creating a dark dead pixel reference data, and for each gain condition and exposure time combination, identifying locations of dark dead pixels, which require compensation.

17. The method according to claim 15, further comprising creating a white dead pixel reference data, and for each gain condition and exposure time combination, identifying locations of white dead pixels, which require compensation.

18. The method according to claim 15, further comprising creating a saturation dead pixel reference data, and for each gain condition and exposure time combination, identifying locations of saturation dead pixel, which require compensation.

19. The method according to claim 14, further comprising creating a bad pixel reference data for each gain condition and exposure time combination, and identifying locations of bad pixels which require compensation.

20. The method according to claim 14, further comprising selecting one of said dark current and hot pixel reference data by selecting one of said plurality of gain and exposure combinations based on said gain and exposure combination that most closely matches the gain and exposure combination of said second data.

21. The method according to claim 20, further comprising smoothing said pixels affected by dark current using signal values from available neighboring pixels, said pixels affected by dark current being identified using said selected dark current and hot pixel reference data, said signal value of each pixel identified as affected by dark current being retrieved from said second data.

22. The method according to claim 21, wherein said smoothing is accomplished by averaging said signal values of said neighboring pixels.

23. The method according to claim 20, further comprising scaling down the signal value of a pixel affected by dark current, said pixels affected by dark current being identified using said selected dark current and hot pixel reference data, said signal value of each pixel identified as affected by dark current being retrieved from said second data.

24. The method according to claim 23, wherein said scaling down is accomplished by multiplying said signal value by an average signal value for dark current and hot pixels at the selected gain and exposure combination and dividing by the signal value of the pixels to be compensated.

25. The method according to claim 16, further comprising compensating for dark dead pixels by scaling down the signal level of pixels identified as dark dead pixels to an average signal level for normal pixels under the no light condition using said dark dead pixel reference data to locate said dark dead pixels.

26. The method according to claim 17, further comprising compensating for white dead pixels by one of scaling up and scaling down the signal level of pixels identified as white dead pixels to an average value for normal pixels under said first light condition using said white dead pixel reference data to locate said white dead pixels.

27. The method according to claim 18, further comprising compensating for saturation dead pixels by scaling up the signal level of pixels identified as saturation dead pixels to an average value for normal pixels under said second light condition using said saturation dead pixel reference data to locate said saturation dead pixels.

28. The method according to claim 19, further comprising compensating for bad pixels by selecting one of said bad pixel reference data based on selecting one of said gain and exposure time combinations and scaling the signal level of pixels identified as bad pixels to correspond linearly with said exposure time selected.

29. The method according to claim 28, further comprising color compensating bad pixels using a formula based on a number of defective colors for the bad pixels.

30. A digital camera system comprising:

an image sensor;

a dark current and defective pixel compensation circuit for compensating first data corresponding to an actual image; and

an image processor coupled to said dark current and defective pixel compensation circuit for forwarding said first data from said image sensor to said dark current and defective pixel compensation circuit.

31. The digital camera system according to claim 30, wherein said dark current and defective pixel compensation circuit further comprises:

at least one processor;

a bus; and

a storage system, coupled to said at least one processor via said bus, for storing first data corresponding to said at least one actual image and said second data corresponding to one of said at least one dark current reference image and said at least one white reference image captured by said image sensor.

32. The digital camera system according to claim 31, wherein said storage system further comprises:

a memory device coupled to said at least one processor via said bus; and

at least one non-volatile memory device coupled to said at least one processor via said bus.

33. A computer system comprising:

a first processor;

a memory device coupled to said processor via a bus;

at least one input/output device, said at least one input/output device coupled to said processor via said peripheral bus, said input/output device being an imaging device;

said imaging device further comprising:

a storage system for storing first data corresponding to at least one actual image and second data corresponding to one of at least one dark current reference image and at least one white reference image captured by a pixel array; and

at least one second processor coupled to said storage system for compensating said data corresponding to said actual image.

34. An image processing apparatus comprising:

a storage system for storing first data corresponding to at least one actual image and data corresponding to at least one dark current reference image and at least one white reference image captured by a pixel array; and

a processor coupled to said storage system for compensating said first data using said second data.

35. An image processing apparatus comprising:

a storage system for storing first data corresponding to at least one actual image and second data corresponding to at least one dark current reference image and at least one white reference image captured by a pixel array; and

a processor coupled to said storage system for compensating said first data using said second data, wherein said storage system stores gain conditions and exposure times associated with said first data, said storage system further stores gain conditions and exposure times associated with said second data, and said storage system processor further stores light condition information for said second data.

36. A digital camera system comprising:

an image sensor;

a dark current and defective pixel compensation circuit for compensating first data corresponding to an actual image; and

an image processor coupled to said dark current and defective pixel compensation circuit for forwarding said first data from said image sensor to said dark current and defective pixel compensation circuit.

37. The digital camera system according to claim 36, wherein said dark current and defective pixel compensation circuit further comprises:

at least one processor;

a bus; and

a storage system, coupled to said at least one processor via said bus, for storing first data corresponding to said at least one actual image and second data corresponding to said at least one dark current reference image, and said at least one white reference image captured by said image sensor.

38. A computer system comprising:

a first processor;

a memory device coupled to said processor via a bus;

at least one input/output device, said at least one input/output device coupled to said processor via said peripheral bus, said input/output device being an imaging device;

said imaging device further comprising:

a storage system for storing first data corresponding to at least one actual image and second data corresponding to one of at least one dark current reference image and at least one white reference image captured by a pixel array; and

at least one second processor coupled to said storage system for compensating said data corresponding to said actual image.

39. A dark current and defective pixel compensation circuit comprising:

at least one processor;

a bus; and

a storage system, coupled to said at least one processor via said bus, for storing first data corresponding to said at least one actual image and second data corresponding to said at least one dark current reference image and said at least one white reference image captured by said image sensor.

40. An integrated circuit comprising:

a dark current and defective pixel compensation circuit for compensating first data corresponding to an actual image; and

an image processor coupled to said dark current and defective pixel compensation circuit for forwarding said first data from said image sensor to said dark current and defective pixel compensation circuit.

41. The integrated circuit according to claim 40, wherein said dark current and defective pixel compensation circuit further comprises:

at least one processor;

a bus; and

a storage system, coupled to said at least one processor via said bus, for storing first data corresponding to said at least one actual image and second data corresponding to said at least one dark current reference image and said at least one white reference image captured by said image sensor.